MANITOBA

Guidelines for the Development of Infection Control Programs in Rural Hospitals

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GUIDELINES

FOR THE DEVELOPMENT OF

INFECTION CONTROL PROGRAMS

IN RURAL HOSPITALS

PREFACE

A frequent request from Rural hospitals has been for assistance in setting up a nosocomial infection control program. Information available in publication is generally geared for large hospitals and it sometimes refers to 300 - 500 bed hospitals as small hospitals. Extrapolation of such programs to suit 5 - 150 bed hospitals by those inexperienced in such practices frequently proves impossible. Furthermore a detailed step by step approach is omitted as the authors assume that those engaged in such a program already have a formal background in infection control.

This handbook is designed to allow those interested in an infection control program but who have limited background knowledge to implement an effective program. It may therefore appear over-simplified in some areas to those familiar with infection control programs. It is not an exhaustive presentation and areas requiring more detail can be dealt with by making specific enquiry to the Provincial Nosocomial Infection Control Practitioner at the Cadham Provincial Laboratory, Winnipeg (944-0270). Short training courses for infection control practitioners can also be arranged through the Cadham Provincial Laboratory. These will be individualized to the Infection Control Practitioner's needs.

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INTRODUCTION

The initial observation that infections could be limited by control measures was made by Ignaz Philipp Semmelweis in 1847. He was able to show that washing his hands between doing autopsies and delivering babies greatly reduced puerperal sepsis. In the ensuing years medicine has advanced rapidly, yet infection control has emerged only recently as a new discipline in hospitals. The significant impact of nosocomial, or hospital-acquired, infections on patient's morbidity and mortality, the rising cost of caring for the estimated 5 - 10% of patients who acquire nosocomial infections and the increasingly visible legal aspect of medical care have prompted the development of infection control programs.

Infection control programs are one responsibility of hospital administration. The administration and ultimately the Board have a responsibility to provide a safe environment for patient care and this safe environment includes freedom from hospital acquired infections. Because all personnel in the hospital must contribute to achieve this objective a committee representing medical staff and the various departments is established to run the program.

Hospital procedures are developed with the specific objective of reducing the likelihood of any patient succumbing to an infection within the hospital. The Infection Control Committee has the responsibility to review the actual procedures to ensure that they support good infection control.

Procedures in all departments are involved whether they relate to food handling by dietetic staff, dressing changes or isolation technique by nursing and medical staff, autoclaving by central supply staff or cleaning procedures by housekeeping and maintenance staff.

If the majority of patients are "processed" through the hospital without acquiring hospital-generated (nosocomial) infections then it can be reasonably assumed that procedures are adequate for infection control and personnel are adhering to the established procedures. However, because infection control does involve continual, scrupulous adherence to the detail of procedures by people, there is always a chance of breakdown. The Infection Control Committee may frequently provide the first warning of a breakdown in the system as they review the statistics collected by the Infection Control Practitioner and can note increased frequency of various infections in the hospital should this occur.

Data related to infection control programs in small hospitals (i.e. less than 150 beds and ranging down to 5 beds) is meagre and extrapolation from those programs appropriate for 300 - 500 bed hospitals is impracticable. The intent of these guidelines is to provide a skeletal structure from which small hospitals can tailor-make a program suitable to their local needs.

INFECTION CONTROL COMMITTEE

Hospital administration is responsible for defining the terms of reference and selecting the representatives for the Infection Control Committee.

In some facilities the Governing Board may have set out the guidelines for the establishment of an Infection Control Committee and its terms of reference in the By-Laws of the facility.

Amalgamation of the Infection Control Committee with other committees such as Pharmacy and Therapeutics or Safety, etc. may be managed but extreme caution should be taken to ensure that the work of the joint committee allows accomplishment of the goals of each of the original committees.

Terms of Reference

1. Hold regular meetings to review hospital infection control and record proceedings with minutes.

2. Review periodically the infections occurring in the hospital.

3. Advise on protocols and their application related to one's own department.

4. Assist the Infection Control Practitioner with collection of data.

5. Make recommendations regarding problems with infection control.

6. Report to Administration with recommendations.

7. Liaise with Medical Staff and other departments.

Composition:

It is imperative that Medical Staff support and be actively involved on the committee. It is advisable that all departments have representatives. It can also be helpful if a representative of the Department of Health and/or Community Services is included in the membership.

From this committee three appointments are made, Chairman, Infection Control Practitioner and Secretary. The majority of the ongoing work of the program (e.g. surveillance and outbreak of infection) will be carried out by these people so it is essential that they be chosen because of interest in the program, knowledge of infectious diseases and microbiology, and ability and willingness to work well together.

1. Chairperson

It is essential that the chairperson be enthusiastic about infection control. S/he must have a good understanding of committee structure and be able to work well with hospital and medical staff, department heads and the committee. Based on experience in centers where infection control has been active and ongoing, it has been found that it is imperative that a physician be chairperson of the Infection Control Committee. S/he will be the committee member with the most knowledge of basics necessary to interpret data related to infection.

A Vice-Chairperson should be designated in the event the chairperson is unable to be present on a scheduled meeting date.

The functions of the chairperson are:

i) To call and conduct meetings.
ii) To communicate recommendations to Administration.
iii) To ensure that Medical Staff and department heads are informed of recommendations and changes in procedures.
iv) To ensure that individuals honor the committee structure and communicate through him/her.

2. Infection Control Practitioner

Of all members of the committee, the Infection Control Practitioner is the pivotal position. It is vital that this person be interested and enthusiastic about the program and that s/he has sufficient background knowledge to make him/her confident and effective in the role.

In a rural facility it is rarely necessary to have a full time Infection Control Practitioner. It is necessary to designate a person who has flexibility in his/her workload. Frequently an operating room or obstetrical nurse fills this role because his/her workload tends to fluctuate. However, careful assessment must be made of various workloads so that time can be dedicated to this function on a regular basis. Otherwise, the time allotted to it is slowly eroded and the program fails.

In choosing an Infection Control Practitioner several qualifications need to be considered:

i) The Infection Control Practitioner should be experienced in clinical nursing and demonstrate both an understanding and practice of infection control methods.

ii) S/he must have the ability to communicate in a tactful and non-threatening way as s/he influences people from varied disciplines in the practice of infection control.

iii) The Infection Control Practitioner requires a basic knowledge of microbiology. This would include the general characteristics of microorganisms, antimicrobial sensitivity patterns and specimen collection.

iv) The Infection Control Practitioner must have some knowledge of epidemiology; infectious diseases and their causative agents, reservoirs of agents, modes of transmission, the concepts of colonization, infection and carriage, factors which modify or eliminate spread of infection.

v) The Infection Control Practitioner must know how to calculate crude rates, interpret data and convert this into useful information.

To find Infection Control Practitioners who already meet all these qualifications would be ideal. However, such people are not always available and training programs to build necessary skills provide the best alternative. Courses of varying lengths are available for Infection Control Practitioners in Ottawa, Charlottesville (Virginia), and Atlanta (Georgia). As well, Cadham Provincial Laboratory will be offering training sessions in Winnipeg for the Infection Control Practitioners from the rural hospitals and personal care homes.

The Infection Control Practitioner has three main functions:

i) Epidemiology

- monitoring nosocomial infections by a system of surveillance, collating data and converting it into information useful to the Infection Control Committee (see Appendix III System of Surveillance).

- investigating outbreaks and instituting immediate control measures.

ii) Administration

- co-ordinating the infection control program
- evaluating effectiveness of protocols
- assuring that current infection control practices are in accord with written protocols
- liaison with community health agencies

iii) Resource

- keeping abreast of current infection control information
- providing education regularly and on request for personnel and patients (families) (e.g. orientation, inservice, personal example)

- assisting with determining protocols
- being available for consultation.

3. Secretary

The secretary again should be someone enthusiastic about infection control. S/he should preferably have some secretarial skills. His/her responsibility is to record minutes of the meetings and handle correspondence.

4. Other Committee Members

In addition to providing expertise at meetings on matters directly related to one's own department, committee members can provide information which is ongoing and important to the function of the program by communicating regularly with the Infection Control Practitioner.

The following are examples of the types of information which would be helpful to the Infection Control Practitioner:

Pharmacist	- notify the Infection Control Practitioner on a regular basis of patients who are receiving antibiotics
	- provide information regarding problems with antibiotic resistance
Dietitian	- inform the Infection Control Practitioner of special diets
	- inform the Infection Control Practitioner of food handling procedures
Laundry	- report to the Infection Control Practitioner any breaks in protocol (e.g. improper bagging of contaminated linen)

Laboratory	- report positive cultures to the Infection Control Practitioner
	- send specimens for appropriate "finger printing" (e.g. phage typing, pyocine typing)
Central Supply	- ensure that autoclaves are operated at the correct temperature, pressure and duration of time; that let-down times are adequate for drying supplies
	- notify the Infection Control Practitioner of quantities of catheters (e.g. urinary, IV, subclavian) or other equipment being used related to infection control
Respiratory Technology	- notify the Infection Control Practitioner of patients requiring ventilation, blood gases, etc.
	- assure that protocols for cleaning equipment are followed
Nurses	- report to the Infection Control Practitioner patients with infections (e.g. post-op wound, pneumonia, bronchitis, diarrhea), with invasive procedures or requiring isolation.

5. Non-Committee Members

Individual staff in the various hospital department should consistently practice the principles of infection control and report to their committee representative any areas of concern which they may identify.

Medical Staff will have agreed on reasonable criteria for nosocomial infections (see Appendix I - Criteria for Nosocomial Infections). They must individually and collectively support principles of infection control. As a group they must assess the validity of recommendations regarding protocols and programs and encourage each other in implementing the infection control program.

Function at Inauguration

First Meeting:

1. Review terms of reference
2. Appoint Chairman, Assistant Chairman, Infection Control Practitioner and Secretary
3. Request medical staff to meet and define nosocomial infections (includes wound infection) and infectious cases (See appendices I and II Criteria for Nosocomial Infections and Infectious Diseases)
4. Assist in drawing up protocols for next meeting, often via subcommittee(s)

Second Meeting:

1. Review definitions and protocols and adopt or request refinement
2. Receive report from Infection Control Practitioner.
3. Approve program and send to the hospital board via the Administrator for adoption as hospital policy

Continuing Function:

1. Meet periodically for review of infections (The frequency of meetings will depend on the size and type of hospital. Usual scheduling is every one or two months.)
2. Review problems encountered.
3. Provide solutions to problems presented by the Infection Control Practitioner or chairman (When necessary, consultation may be sought from the Infection Control resource personnel at the Cadham Provincial Laboratory, 944-0270).
4. Regularly review protocols with identification of new needs.
5. Perform special reviews as requested by medical staff and approved by committee (e.g. antibiotic usage).

ISOLATION

Isolation protocols are established to prevent the transmission of communicable disease from patients to other patients, personnel, or visitors. Conversely, protective isolation is designed to protect highly susceptible patients from contracting infection(s). It is the responsibility of the Infection Control Committee to determine isolation protocols and have them approved by the Medical Staff. The protocols must be applicable to the particular hospital, readily available in written form for reference, and implemented appropriately.

Once the need for isolation is identified, notification of the appropriate measures must be posted on the patient's door or at his cubicle. Colour-coded cards for the different types of isolation are available. However, a less expensive and more individualized form can be used (See Appendix IV The Isolation Room). It should be an attention-getting colour and indicate accurately the precautions necessary. Sufficient equipment should be available to carry out the isolation. The Infection Control Practitioner and appropriate departments (e.g. dietetics, laundry) should be notified.

It may be beneficial for the Infection Control Committee to determine which rooms/areas are best suited to isolation, particularly in special care areas (e.g. recovery room), and include this as part of the ward isolation manual.

The most widely accepted system for isolation is that of categorizing disease according to mode of transmission and defining a suitable technique.

Isolation Techniques for Use in Hospitals

The following section is adapted from Isolation Techniques for Use in Hospital (CDC, 1975).

1. Strict Isolation
   - A. Private room with door closed
   - B. Gowns, masks and gloves worn by all persons entering room
   - C. Handwashing on entering and leaving room
   - D. Articles double-bagged for disposal or transport to Laundry or Central Supply for disinfection/sterilization.

This category is designed to prevent the transmission of highly communicable diseases that are easily spread by direct contact with the patient, airborne route or indirect contact with inanimate articles contaminated by the patient. With cases of diphtheria, varicella and rubella, attending personnel should be immune (Garner and Brachman, 1979).

This category includes open or copiously draining wounds or burns with staphylococcus, pseudomonas or streptococcus, pneumonia due to Staphylococcus aureus of Streptococcus, diphtheria, Varicella and disseminated Herpes zoster, congenital rubella syndrome, neonatal disseminated Herpes simplex and rabies (Refer to Appendix II for a more extensive list of diseases for this and following categories).

2. Respiratory Isolation

A. Private room with door closed
B. Masks worn by any person entering room
C. Handwashing on entering and leaving room
D. Articles contaminated with secretions are discarded or disinfected/sterilized (See Appendix IV Care of Contaminated Articles)

This category is designed to prevent the spread of organisms by the airborne route or by droplets and occasionally by indirect contact with contaminated articles. Personnel susceptible to mumps, measles or rubella should be vaccinated. As well, pregnant women susceptible to rubella should not work in the newborn nursery. (Garner and Brachman, 1979)

This category includes pulmonary tuberculosis, meningococcal meningitis, measles, mumps, rubella, pertussis, Legionnaires' disease, etc.

3. Enteric Precautions

A. Private room for children or uncooperative adults
B. Gowns worn by all persons having direct contact with the patient or contaminated articles
C. Handwashing on entering and leaving room
D. Articles contaminated with feces or urine must be discarded or disinfected/sterilized

This category is designed to prevent the spread of organisms by the fecal-oral route. Strict adherence to handwashing is important for patient as well as personnel. If a room is shared, the infected patient should use the bathroom and the uninfected patient use an alternate bathroom or a commode.

This category includes all diarrheal patients while awaiting establishment of etiology, hepatitis, viral disease - poliomyelitis, ECHO, coxsackie, etc.

4. Wound and Skin Precautions

A. Gown and gloves worn by all persons having contact with the infected wound
B. Handwashing before and after contact with the patient
C. Articles contaminated must be disinfected/sterilized or double-bagged for disposal

This category is designed to prevent the spread of organisms by direct contact with contaminated wound or skin secretions. The degree of drainage determines the need for Wound and Skin or Discharge Precautions.

This category includes gas gangrene, localized Herpes zoster, Herpes simplex, limited wounds or burns with secondary infection, etc.

5. Discharge Precautions

A. Handwashing before and after contact with the patient
B. Articles contaminated with discharge are disinfected/ sterilized or double-bagged for disposal

This category is designed to prevent the spread of organisms by contaminated secretions or excretions in situations where the amount of discharge is minimal or there is a low risk of cross-infection.

This category includes:

a) Secretion - oral: herpetic gingivostomatitis, infectious mononucleosis (EBV), respiratory infectious disease, etc.

- lesion: minor wound/burn, mucocutaneous candidiasis, conjunctivitis, gonorrhea, syphilis, extra-pulmonary Tuberclosis, etc.

b) Excretion: amebiasis, gastroenteritis, CMV, congenital rubella, aseptic meningitis, etc.

6. Blood Precautions

A. Gloves worn for contact with blood
B. Handwashing before and after contact with patient
C. Articles contaminated with blood must be discarded or disinfected/sterilized
D. Blood specimens must be specially labelled and bagged for transport in a transparent bag with requisition attached to the outside.

This category is designed to prevent the spread of organisms by contact with contaminated blood or articles soiled by it (e.g. placenta, clots, blood-stained linen).

This category includes hepatitis and other blood borne infections.

7. Protective Isolation (Reverse Isolation)

A. Private room with door closed
B. Gowns, masks and gloves worn by all persons entering room
C. Handwashing on entering and leaving room

This category is designed to protect patients who have impaired resistance to infection from exposure to potentially pathogenic organisms.

This category includes immunocompromised patients, burns, severe skin disease, etc.

Exposure to Communicable Disease

Patients who have been exposed to the following communicable diseases and are susceptible should be segregated to prevent possible spread during the prodromal phase of the disease to susceptible patients and personnel.

Rubella, Varicella, Mumps	-	7-21 days after exposure
Rubeola	-	5-12 days after exposure

STERILIZATION AND DISINFECTION

In addition to a good patient history, antibiotics, and isolation, sterilization and disinfection are major means of preventing nosocomial infections. It is therefore the responsibility of the Infection Control Committee to ensure that protocols are defined and used accordingly throughout the hospital (see Appendix V Examples of Protocols for Sterilization/Disinfection).

Sterilization is the use of physical or chemical agents to eliminate all viable microbes. Steam and gas autoclaving and dry heat ovens are the common methods.

Autoclaves work on the principle of time, temperature, and pressure. Failure to achieve any one of the above necessary requirements precludes sterilization. Thus, daily autoclave checks (e.g. temperature, pressure, times by graphic methods, judicious use of spore strips) are essential to ensure that protocols have been adhered to and that equipment is functioning normally. Omission of these precautions can lead to use of unsterile supplies, risking nosocomial infections. Results of such testing should be reported regularly to the Infection Control Committee by the central supply representative.

As well, proper packaging, loading, and storage are essential to ensure maintenance sterility. Ongoing education for personnel must be provided by the Infection Control Practitioner or designate.

Disinfection is the use of germicidal chemical agents to destroy potentially infective microbes. Disinfectants and antiseptics are differentiated by the surfaces on which they are used, inanimate and animate respectively.

The numerous agents on the market can often make the choice of the most appropriate agent difficult. All agents, however, do fit into basic categories (see Appendix VI Agents for Sterilization/Disinfection). A knowledge of these with respect to organisms they will kill, problems, benefits, and time of action will allow the Infection Control Committee to evaluate and recommend the best agents.

Prerequisites to maximum effect of an agent are:

a) proper dilution
b) use for recommended time
c) thorough cleaning of articles
d) avoid drying (most agents cease acting when dry)
e) avoid mixing agents which may inactivate one or both

Recommendations for Acceptable Agents

Procedure		Disinfectant/Antiseptic
Handwashing	- routine	None (bar soap)
	- newborn, ICU	Iodophor Chlorhexidine Hexachlorophene
	- pre-op	Wash + 70% alcohol Iodophor .5% Hexachlorophene 4% Chlorhexidine
Skin Prep	- mid-stream urine	Soap/water, rinse well
	- catheter	Iodophor
	- wounds	70% Alcohol
	- IV - regular	70% Alcohol
	- cannula	1% Iodine (dry 2 min.) wipe ċ alcohol
	- lumbar puncture, etc.	" "
	- pre-operative	hexachlorophene for several days 1% Iodine/alcohol iodophor - 10% povidone-iodine .5% chlorhexidine in 70% alcohol
	- cords	alcohol
Instruments	- Fibre optics	glutaraldehyde (rinse ċ sterile water ċ 10 mg chlorine or 70% alcohol & dry)
	- Cystoscopes	glutaraldehyde
	- Anaesthetic tubing	"
	- Respiratory equipment	"
	- Forceps	"
	- Thermometers	"
Environmental		phenolic or hypochlorite
Floors	- regular	detergent and water
	- Operating Room, Isolation	phenolic germicide and detergent

Waste Disposal

The quantity of solid waste generated in hospitals continues to increase. Much of this is potentially hazardous and is considered "pathological" waste (e.g. dressings, contaminated disposable items, human tissue, bacteriological cultures, urine, blood and stool samples).

Initial treatment of such waste includes the use of rigid containers for sharp items and double-bagging with impervious plastic bags for all other potentially infectious material. Such waste is then ready to transport for decontamination and/or disposal.

Several disposal methods are possible, although in rural facilities some may not be feasible.

1. Sterilization - autoclaving "pathological" waste (e.g. needles, syringes, biological cultures, human tissue) will render it sterile, making it safe for disposal with other non-infectious waste. For aesthetic reasons this method is impracticable when only one autoclave is available.

2. Incineration - this has the potential to safely destroy all combustible waste. However, there are problems with this method:

   a) Many communities prohibit the use of incinerators within their boundaries.

   b) Many hospital incinerators are inadequate for the quantity of waste and are unable to meet air pollution standards.

   c) The heat of the incinerator may be insufficient to completely destroy many plastics and glass with the resultant residuum clogging up the incinerator.

   d) Some plastics produce toxic gases when incinerated.

   e) Incineration at disposal sites is not controlled by the hospital and may not occur immediately after delivery of waste.

3. Landfill - This method of waste disposal may occur as sanitary landfill or uncontrolled dumping. The first is preferable since it decreases the possibility of contamination of scavengers. Compacting or grinding solid waste can also eliminate such hazards.

   Other areas of concern include pollution of water via runoff or leaching and contamination of refuse workers and the environmental by waste during transit.

   Incineration prior to landfill not only substantially decreases the space required but also can decrease or eliminate many of the above hazards.

4. Grinding - This method employs grinders as a means reducing waste so it can be discharged into the municipal sewage. Grinders are expensive and subject to many mechanical problems. As well, pathogens are introduced into the sewage system and the cost of sewage treatment increases.

It is recommended that autoclaving of pathological waste be the treatment of choice.

Other methods of sterilization using Gases (Et_2O canisters, Formalin), Liquid Formalin, or microwave ovens are not recommended.

URINARY CATHETERIZATION

The most common site of nosocomial infection is the urinary tract. The use of an indwelling urinary catheter greatly increases the risk of acquiring such an infection. Some factors which influence this risk are:

1. Method of Insertion - sterile procedure minimizes the introduction of bacteria into the urinary tract.

2. Closed Drainage System - the risk with a closed system is approximately 80% lower than with an open one (Maki et al. 1972). The system should not be broken for specimen collection or ambulation.

3. Duration of Catherization - the risk of infection increases 5 - 10% for each day of catheterization (Stamm, 1975). Therefore, indwelling urinary catheters should be used only when absolutely necessary and removed as soon as possible.

4. Cross-contamination - bacteria are transmitted on hands from one catheterized person to another. Patients with catheters should be widely separated from each other to enforce use of separate equipment (e.g. emptying receptacle) and better handwashing practice.

Indications

1. Acute retention of urine

2. Incontinence of urine complicating care of wounds/pressure sores

Nosocomial Urinary Tract Infection

Urine culture $\geq 10^5$ colonies of bacteria/ml not present on admission or $\geq 10^5$ colonies of an organism different from that present on admission.

Signs and Symptoms of Urinary Tract Infection

The diagnosis of Urinary Tract Infection may be considered initially because of signs or symptoms the patient exhibits. These include:

1. Acute pylonephritis - fever, chills, flank pain, renal tenderness
2. Urethritis-cystitis syndrome - dysuria, frequency, urgency, suprapubic pain, haematuria

For confirmation, a fresh, uncontaminated midstream or catheter urine specimen should be tested for culture and sensitivity. More than two types of organisms usually indicates contamination and a further specimen should be obtained properly. This may occur, however, in patients with indwelling catheters who have become symptomatic. In such cases, this information plus a request for identification of all organisms should be written on the requisition.

Asymptomatic bacteriuria may be present in low levels in the elderly or people with long term indwelling catheters and usually does not require therapy. In children and pregnant females the condition is frequently treated (Ronald, 1974).

Urine Specimens for Culture and Sensitivity

1. Collect under supervision of a nurse to ensure that a midstream or catheter specimen has not been contaminated (see Appendix VII Procedure)

2. Freshly voided urine cultured immediately is the optimal procedure In this way the colony count reliably reflects the numbers of organisms per ml of freshly voided urine. Because organisms multiply in urine at room temperature, misleading colony counts are obtained when there is significant delay before planting (3+ hours). Holding urine at $4^{\circ}C$ in the refrigerator immediately after the specimen is obtained will greatly reduce bacterial multiplication, thus yielding satisfactory colony counts. When uricults are used, they need not be refrigerated.

3. Obtain specimen before antibiotic treatment is initiated

EMPLOYEE HEALTH PROGRAM

Hospital employees have a greater potential of acquiring or transmitting nosocomial infections than the average population. The infection control committee is responsible for the infection control aspects of employee health. Although the size of the facility will probably determine whether infection control and employee health are joined or distinct responsibilities, such aspects as general health, immunization and contact follow-up are basic to controlling infection among employees. A program should be developed to include all these areas (See Appendix VIII for Example of a Protocol for Employee Health).

APPENDIX I

CRITERIA FOR NOSOCOMIAL INFECTIONS

Concise definitions of the major types of nosocomial infections are a prerequisite for consistent, accurate surveillance. They must be comprehensive enough to identify the majority of infections, yet concise enough to be functional for all medical, nursing personnel. Definitions for all types of nosocomial infections are provided by the medical staff to the Infection Control Committee. It is the responsibility of the Infection Control Committee to determine whether definitions are useful in the daily running of the program. If they are not, the medical staff should be requested to reassess the definitions.

Nosocomial Infection

Any infection occurring in a hospitalized patient with an organism acquired in the hospital is a nosocomial infection. This includes infections such as respiratory, enteric, post-partum, surgical wound, neonatal. For infections with exanthems, the appearance of the exanthem must occur in a patient whose duration of hospitalization is either greater than the shortest recognized incubation period of the disease or shorter than the longest recognized incubation period of the disease. It may be further confirmed by the detection of the index case who originally infected this patient. Patients arriving in hospital with pneumonia, infected wounds (e.g. from car accidents, decubiti) or neonatal infections acquired from the birth canal are not nosocomial infections. Their inclusion in this program is invalid and only leads to confusion. Also any infection occurring in a hospital employee which was acquired through contact with an infectious patient is nosocomial.

Wound Infection

Postoperatively or >72 hours after admission:

- erythema and induration ≥10 mm either side of the wound
- purulent discharge from the wound
- pus from stitch site(s)
- separation of wound edges less than 72 hours following removal of sutures
- meningitis or osteomyelitis post neuro or EENT surgery
- empyema or osteomyelitis of ribs post thoracic surgery
- endocarditis post cardiac surgery
- abdominal abscess post clean or non-infected surgery
- arthritis or osteomyelitis post orthopedic surgery
- pelvic abscess or cellulitis post obstetrical/gynecological surgery

1. Surgical

The majority of wound infections will be surgical. A more precise profile of surgical wound infections is obtained by using a classification of wounds as defined by the National Research Council (Cruse and Foord, 1973):

Clean - operations in which the gastro-intestinal tract or respiratory tract was not entered, in which no apparent inflammation was encountered, and in which no break in aseptic technique occurred.

Clean - Contaminated - clean operations that entered the gastrointestinal tract or the respiratory tract but in which there was no significant spillage.

Contaminated - operations in which acute inflammation (without pus formation) was encountered, or in which gross spillage from a hollow viscus occurred. Fresh traumatic wounds and operations in which a major break in aseptic technique occurred are not included.

Dirty - operations in which pus was encountered or in which a perforated viscus was found. "Old" traumatic wounds included here.

2. Burn

Bacteremia or fungaemia. Following hospitalization with burns, this may be nosocomial but after antibiotic therapy and a change in organisms (e.g. S. aureus, P. aeruginosa) it usually is nosocomial.

Urinary Tract Infections (UTI)

Urine culture $\geq 10^5$ colonies of bacteria/ml. not present on admission or $\geq 10^5$ colonies of an organism different from that present on admission.

Respiratory Tract Infection

1. Upper

Rhinorrhea, conjunctivitis, pharyngitis, and/or otitis media occurring >72 hours after admission. This may be associated with onset of fever or cough.

2. Lower

(a) Pneumonia, lung abscess, or empyema following anesthesia or a

period of unconsciousness or associated with a nosocomial upper respiratory infection and fever. These may be associated with cough or purulent sputum and definite diagnostic changes on X-ray.

(b) Bronchitis or Tracheobronchitis occurring > 72 hours after admission in a patient admitted without respiratory signs or symptoms

Gastroenteritis

Liquid stools unexplained by feeding or medication post admission and containing a pathogen (e.g. bacterial, viral) and unrelated to the admitting diagnosis. The onset of diarrhea should be greater than the incubation of the pathogen identified. The duration is usually greater than 48 hours in the elderly and reflects a definite change in bowel habit.

Bacteremia

A positive blood culture usually confirms bacteremia. The organism causing this should be acquired in hospital to be included as a nosocomial infection.

Intravenous (IV)

1. Peripheral

Inflammation at the IV site with or without bacteremia or pus from the site (septic thrombo-phlebitis)

2. Deep Vein

Bacteremia or fungaemia in the presence of a deep line (e.g. Total Parenteral Nutrition, IV, umbilical artery catheter). Confirmed by removal of the line and culturing the tip of the catheter.

Endometritis

Purulent cervical discharge with a positive culture

Neonatal

Any infection, bacterial or viral, acquired by a neonate except one which originated from a pathogen in the birth canal (e.g. gonnococcus, herpes).

APPENDIX II

INFECTIOUS DISEASES

The following section is adapted from Isolation Techniques for Use in Hospital (CDC, 1975).

Type of Isolation or Precautions

BP	Blood Precautions	RI	Respiratory Isolation
EnP	Enteric Precautions	SeP	Secretion Precautions
ExP	Excretion Precautions	SI	Strict Isolation
PI	Protective Isolation	WSP	Wound & Skin Precautions

Duration of Isolation or Precautions

- CN - until off antibiotics and Culture-Negative
- DH - Duration of Hospitalization
- DI - Duration of Illness (with wounds or lesions, DI means until they stop draining)
- U - Until 24 hours after initiation of effective therapy

Disease	Isolation or Precautions: Type	Duration
Actinomycosis		
Draining lesions	SeP	DI
Other	none	
Amebiasis (amebic dysentery)	ExP	DI
Anthrax		
Cutaneous	SeP	CN
Inhalation	SI	DI
Arthropodborne viral encephalitides (eastern equine and western equine encephalomyelitis, St. Louis and Venezuelan equine encephalitis)	none	
Ascariasis	none	
Brucellosis (undulant fever, Malta fever, Mediterranean fever)		
Draining lesions	SeP	DI
Other	none	

Disease	Type	Duration
Burn wound	SI, WSP, or SeP (1)	DI
Candidiasis		
Mucocutaneous (moniliasis, thrush).	SeP	DI
Other	none	
Chickenpox (varicella)	SI	(2)
Closed cavity infection		
Draining	SeP	DI
Not draining	none	
Clostridium perfringens		
Food poisoning	ExP	DI
Wound infection		
Gas gangrene	WSP	DI
Other	SeP	DI
Congenital rubella syndrome	SI	DH
Conjunctivitis, acute bacterial (sore eye, pink eye)	SeP	U
Conjuctivitis, gonococcal (ophthalmia neonatorum)	SeP	U
Conjunctivitis, viral (neonatal inclusion paratrachoma, inclusion and swimming pool conjunctivitis	SeP	DI
Cytomegalovirus	none	
Diarrhea, acute-infective etiology suspected	EnP	DI
Diphtheria (pharyngeal)	SI	(3)
(cutaneous)	SeP	DI

---

1. Depending on the extent of infection
2. For 7 days after eruption first appears in normal host; in immunosuppressed hosts, DI; in asymptomatic susceptible patient exposed to varicella, for 3 weeks after exposure.
3. Until 2 cultures from both nose and throat and from skin lesions, if present, taken at least 24 hours apart after cessation of antimicrobial therapy are negative for C. diphtheriae.

Disease	Type	Duration
Encephalitis or encephalomyelitis, arthropodborne	none	
Exterobiasis (pinworm disease, oxyuriasis)	ExP	DI
Escherichia coli gastroenteritis		
Enteropathogenic	EnP	(4)
Enterotoxic	EnP	DI
Fever of unknown origin	(5)	
Food poisoning		
Botulism	none	
Clostridium perfringens (C. welchii food poisoning	ExP	DI
Salmonellosis (non-typhoidal)	EnP	DI
Staphylococcal food poisoning	ExP	DI
Furunculosis-staphylococcal	WSP	DI
Gastroenteritis		
Enteropathogenic E. coli	EnP	(4)
Enterotoxic E. coli	EnP	DI
Salmonella species (excepi S. typhi)	EnP	DI
Salmonella typhi	EnP	(6)
Shigella species	EnP	(6)
Yersinia enterocolitica	EnP	DI
German measles (rubella)(see also congenital rubella syndrome)	RI	(7)
Giardiasis	ExP	DI
Gonococcal ophthalmia neonatorum (gonorrheal ophthalmia, acute conjunctivitis of the newborn)	SeP	U
Gonorrhea	SeP	U

4. Until 3 consecutive cultures or fluorescent antibody tests of feces taken after cessation of antimicrobial therapy are negative for infecting strain.

5. Patients with fever of unknown origin usually need not be isolated; however, if a patient has signs and symptoms compatible with a disease that calls for isolation, it is appropriate to isolate that patient pending confirmation or exclusion of that diagnosis.

6. Until 3 consecutive cultures of feces taken after cessation of antimicrobial therapy are negative for infecting strain.

7. For 5 days after onset of rash.

Disease	Type	Duration
Burn wound	SI, WSP, or SeP (1)	DI
Candidiasis		
Mucocutaneous (moniliasis, thrush)	SeP	DI
Other	none	
Chickenpox (varicella)	SI	(2)
Closed cavity infection		
Draining	SeP	DI
Not draining	none	
Clostridium perfringens		
Food poisoning	ExP	DI
Wound infection		
Gas gangrene	WSP	DI
Other	SeP	DI
Congenital rubella syndrome	SI	DH
Conjunctivitis, acute bacterial (sore eye, pink eye)	SeP	U
Conjuctivitis, gonococcal (ophthalmia neonatorum)	SeP	U
Conjunctivitis, viral (neonatal inclusion paratrachoma, inclusion and swimming pool conjunctivitis	SeP	DI
Cytomegalovirus	none	
Diarrhea, acute-infective etiology suspected	EnP	DI
Diphtheria (pharyngeal)	SI	(3)
(cutaneous)	SeP	DI

1. Depending on the extent of infection
2. For 7 days after eruption first appears in normal host; in immunosuppressed hosts, DI; in asymptomatic susceptible patient exposed to varicella, for 3 weeks after exposure.
3. Until 2 cultures from both nose and throat and from skin lesions, if present, taken at least 24 hours apart after cessation of antimicrobial therapy are negative for C. diphtheriae.

Disease	Type	Duration
Encephalitis or encephalomyelitis, arthropodborne	none	
Exterobiasis (pinworm disease, oxyuriasis)	ExP	DI
Escherichia coli gastroenteritis		
Enteropathogenic	EnP	(4)
Enterotoxic	EnP	DI
Fever of unknown origin	(5)	
Food poisoning		
Botulism	none	
Clostridium perfringens (C. welchii food poisoning	ExP	DI
Salmonellosis (non-typhoidal)	EnP	DI
Staphylococcal food poisoning	ExP	DI
Furunculosis-staphylococcal	WSP	DI
Gastroenteritis		
Enteropathogenic E. coli	EnP	(4)
Enterotoxic E. coli	EnP	DI
Salmonella species (except S. typhi)	EnP	DI
Salmonella typhi	EnP	(6)
Shigella species	EnP	(6)
Yersinia enterocolitica	EnP	DI
German measles (rubella)(see also congenital rubella syndrome)	RI	(7)
Giardiasis	ExP	DI
Gonococcal ophthalmia neonatorum (gonorrheal ophthalmia, acute conjunctivitis of the newborn)	SeP	U
Gonorrhea	SeP	U

---

4. Until 3 consecutive cultures or fluorescent antibody tests of feces taken after cessation of antimicrobial therapy are negative for infecting strain.

5. Patients with fever of unknown origin usually need not be isolated; however, if a patient has signs and symptoms compatible with a disease that calls for isolation, it is appropriate to isolate that patient pending confirmation or exclusion of that diagnosis.

6. Until 3 consecutive cultures of feces taken after cessation of antimicrobial therapy are negative for infecting strain.

7. For 5 days after onset of rash.

Disease	Type	Duration
Hand, foot & mouth disease	ExP	DH
Hepatitis, viral		
Type A (infectious, epidemic hepatitis).....	EnP & BP	DH (8)
Type B (serum, homologous serum hepatitis)	EnP & BP	DH (9)
Unspecified type, consistent with viral etiology	EnP & BP	(10)
Hepatitis B antigen carrier	BP	DH
Herpangina	SeP & ExP	DH
Herpesvirus hominis (herpes simplex)	WSP	DI
Disseminated neonatal (neonatal vesicular disease)	SI	DI
Mucocutaneous	SeP (11)	DI
Herpes zoster		
Disseminated	SI	DI
Localized	WSP	DI
Infectious mononucleosis	SeP	DI
Influenza	none (12)	
Keratoconjunctivitis, infectious (epidemic keratoconjunctivitis, infectious punctate keratitis)....	SeP	DI
Measles (rubeola) including encephalitis	RI	(13)
Meningitis		
Aseptic (nonbacterial, abacterial viral, or serous meningitis)....	ExP	DH
Listeria monocytogenes.....	SeP	DI
Neisseria meningitidis (meningococcal).....	RI	U
Other bacterial	none	

8. Need for isolation may be reconsidered 2 weeks after onset of jaundice.

9. Need for isolation may be reconsidered when blood becomes consistently negative for hepatitis B surface antigen.

10. Until infectious etiology is excluded; otherwise same as required for the responsible agent.

11. Persons with eczema should avoid contact with oral secretions of patients with herpetic lesions.

12. There may be instances when Respiratory Isolation of patients with influenza is indicated, especially if the diagnosis can be made on or soon after admission.

13. For 4 days after onset of rash.

Disease	Type	Duration
Meningococcemia	RI	U
Mumps (infectious parotitis)	RI	(14)
Mycoplasma pneumonia	SeP	DI
Pediculosis	none	(15)
Pertussis (whooping cough)	RI	(16)
Pleurodynia (Bornholm disease, epidemic myalgia)	ExP	DH
Pneumonia		
Bacterial-not listed elsewhere	SeP	DI
Mycoplasma (primary atypical pneumonia, Eaton agent pneumonia)	SeP	DI
Pneumocystis carinii	none	
Staphylococcus aureus	SI	DI
Streptococcus, group A	SI	U
Viral	SeP	DI
Puerperal sepsis	WSP	DI (17)
Rabies (hydrophobia)	SI	DI
Respiratory infectious disease, acute (if not covered elsewhere)	SeP	DI
Rheumatic fever (acute articular rheumatism)	none	
Ringworm (dermatophytosis, dermatomycosis, tinea)	none	
Roseola infantum (exanthem subitum)	none	
Rubella (German measles)(see also congenital rubella syndrome)	RI	(18)
Rubeola (measles) including encephalitis	RI	(19)

---

14. For 9 days after onset of swelling.

15. Close contact with patient or his personal effects could result in transmission; initiation of effective treatment rapidly reduces this hazard.

16. For 7 days after onset of therapy with either erythromycin or ampicillin; if no therapy is given, for 3 weeks after onset of paroxysms.

17. For 24 hours after onset of chemotherapy.

18. For 5 days after onset of rash.

19. For 4 days after onset of rash.

Disease	Type	Duration
Salmonellosis (for S. typhi, see typhoid fever)	EnP	DI
Scabies	none (20)	
Shigellosis (including bacillary dysentery)	EnP	(21)
Skin infections	SI, WSP or SeP (22)	DI
Staphylococcal disease (S. aureus)		
Burns	SI, WSP, or SeP (22)	DI
Enterocolitis	EnP	CN
Gastroenteritis	ExP	DI
Lung abscess, draining	SI	DI
Pneumonia	SI	DI
Skin infection	SI, WSP, or SeP (22)	DI
Wound infection	SI, WSP, or SeP (22)	DI
Streptococcal disease (group A streptococcus)		
Burns	SI, WSP, or SeP (22)	DI
Endometritis (puerperal sepsis)	WSP	U
Pharyngitis	SeP	U
Pneumonia	SI	U
Scarlet fever	SeP	U
Skin infection	SI, WSP or SeP (22)	DI
Wound infection	SI, WSP or SeP (22)	DI
Streptococcal disease (not group A unless covered elsewhere	none	
Syphilis, mucocutaneous	SeP	U
Tuberculosis		
Pulmonary, suspected or sputum-positive	RI	(23)
Extrapulmonary, draining lesion	SeP	DI

---

20. Close contact with patient or his personal effects could result in transmission; initiation of effective treatment rapidly reduces this hazard.

21. Until 3 consecutive cultures of feces taken 24 hours apart after cessation of antimicrobial therapy are negative for infecting strain.

22. Depending on the extent of infection.

23. Until effective therapy begins & there is clinical improvement; see Respiratory Isolation section in text.

Disease	Type	Duration
Typhoid fever (enteric fever, typhus abdominalis).....	EnP	(24)
Urinary tract infection (including pyelonephritis)	none (25)	
Varicella (chickenpox).....	SI	(26)
Viral diseases		
ECHO or Coxsackie gastroenteritis, pericarditis, myocarditis, or meningitis	EnP	DH
Respiratory (if not covered elsewhere).....	SeP	DI
Whooping cough (pertussis)	RI	(27)
Wound infections	SI, WSP, or SeP (28)	DI

---

24. Until 3 consecutive cultures of feces taken after cessation of antimicrobials are negative for S. typhi.

25. Bacteriuric catheterized patients may serve as a source of microorganisms transmitted by direct contact to others, especially others with urinary catheters; adequate handwashing must be performed; spatial dispersal of catheterized patients should also be considered.

26. For 7 days after onset of eruption in normal host; in immunosuppressed hosts, DI; in asymptomatic susceptible patient exposed to varicella, for 3 weeks after exposure.

27. For 7 days after onset of therapy with either erythromycin or ampicillin; if no therapy is given, for 3 weeks after onset of paroxysms.

28. Depending on the extent of infection (see Table 1, p. 7, and appropriate sections in text.)

APPENDIX III

SYSTEM OF SURVEILLANCE

Surveillance is the system by which real and/or potential nosocomial infections are identified and documented. Several systems (e.g. Kardex, retrospective chart review, positive lab cultures) have been tried with varying degrees of success. The more sources the Infection Control Practitioner avails herself of, the more accurate her identification of nosocomial infections will be. Small hospitals, with their ease of interdepartmental communication, can incorporate several sources into their system of surveillance. Examples are:

Laboratory	- positive cultures, unusual pathogens, microbial finger-printing (e.g. phage and pyocine typing)
X-Ray	- new infiltrates
Pharmacy	- antibiotics started
Dietetics	- significant diet changes
Housekeeping	- extra procedures or cleaning, etc.
Nursing Units	- ask nurses - elevated temperatures - risk factors in Kardex - visit patients - complaints - cough, "flu" - tubes - IV, catheter
Public Health	- infections post discharge

Equally important to surveillance is the consistency with which the chosen system is used. A system which identifies the largest number of nosocomial infections in the time allotted to surveillance will provide the necessary data. Done consistently, this will ensure an accurate profile of the infections in the hospital. Knowing the rates of nosocomial infections endemic to one's hospital permits rapid identification of deviations (outbreaks, epidemics).

Forms

Once nosocomial infections are identified, the data must be collected in a manner which makes them useful and retrievable. The "Line Listing" is probably the most serviceable form for collecting data and is a permanent, ongoing record kept by the Infection Control Practitioner.

Line Listing of Nosocomial Infections

Name	Service	Ward	Age	Sex	Date Adm.	Primary Diag.	Surg. Date	Site Inf.	Date Onset	Date Cult.	Cult. Results	Comments

In addition, the "Infection Report Form" is used by some hospitals. However, it tends to be a) used inconsistently and/or incompletely b) redundant c) unpopular with many physicians.

Infection Report Form

Name:
Date of Adm.
Age: Sex:
Hosp. No.:
Service:

1. Was the patient admitted with an infection? Yes ( ) No ( )
2. Did the patient acquire a nosocomial inf.? Yes ( ) No ( )

Date of onset _____

3. Type of infection

UTI ( ) Respiratory ( ) Wound ( )

Other _____

A. Was culture obtained? Yes ( ) No ( ) Date _____

B. Result of culture: _____

C. If surgery performed: Type _____

Date _____

D. Primary Diagnosis _____

E. Comments _____

Reported by: _____

At regular intervals (monthly) the data from the "line listing" must be converted into infection rates. It is important to know not only the overall infection rate but those specific to service, site and pathogen.

Monthly Nosocomial Infection Report

Month/Year

Number of nosocomial infections _____

Hospital discharges _____

Infection ratio _____

Service	Number of Infections	Discharges	Infection Ratio
Medicine			
Surgery			
- clean			
- clean-contaminated			
- contaminated			
- dirty			
Obstetrics			
Paediatrics			
Newborn			
(for use where two or more wards for one service)			
Medicine - A			
- B			
Surgery - C			
- D			

(Compare CDC, 1978)

Nosocomial Infections by Site and Pathogen

Month/Year

Pathogen	U.T.I.	Pulm.	Gastro.	Bacteremia	Surgical Wounds: Burn	Cutaneous	Clean	Cl. Cont.	Contam.	Dirty	Other	Total
S. aureus												
S. epidermidis												
Streptococcus pneumoniae												
E. Coli												
Klebsiella												
Enterobacter												
Proteus												
Pseudomonas												
Serratia												
Haemophilus												
Bacteroides												
Candida												
Other												
No. cultured												
Normal flora												
Total												

(Compare CDC, 1978)

Rates

$$\text{Infection Ratio} = \frac{\text{Number of separate infections at the particular site}}{\text{Number of patients at risk}} \times 100$$

For convenience and continuity the denominator is usually the number of discharges (or admissions) per time period (month).

Other rates (e.g. Prevalence, Incidence, Mortality, Morbidity) will be mentioned in the Infection Control literature. Familiarity with the terms is advised although calculation of such rates will usually be unnecessary (see Glossary).

Charts & Graphs

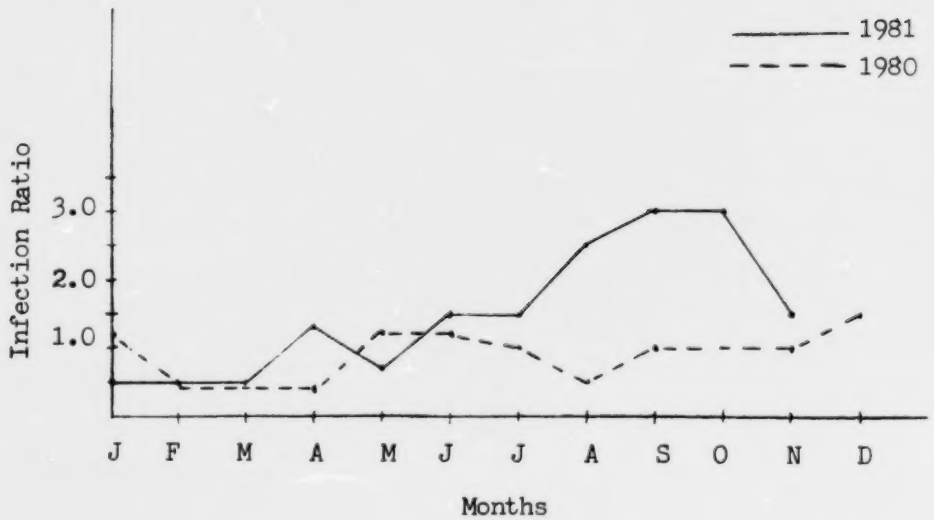
Since pages of statistics tend to be cumbersome and confusing, a further refinement of the data by use of visual aids is helpful. Highlighting a specific ward's rate on their copy will draw attention of the personnel involved. Graphs or charts will show, at a glance, to the Infection Control Committee what trends the rates are taking. Once approved by the Infection Control Committee copies of these data should be distributed to keep personnel informed and to encourage them to maintain or improve their rates with good Infection Control measures.

HIGHLIGHT

Ward	Discharges	Number of Infections	Infection Ratio %
A	20	0	0
B	50	10	20
C	40	2	5

LINE GRAPH

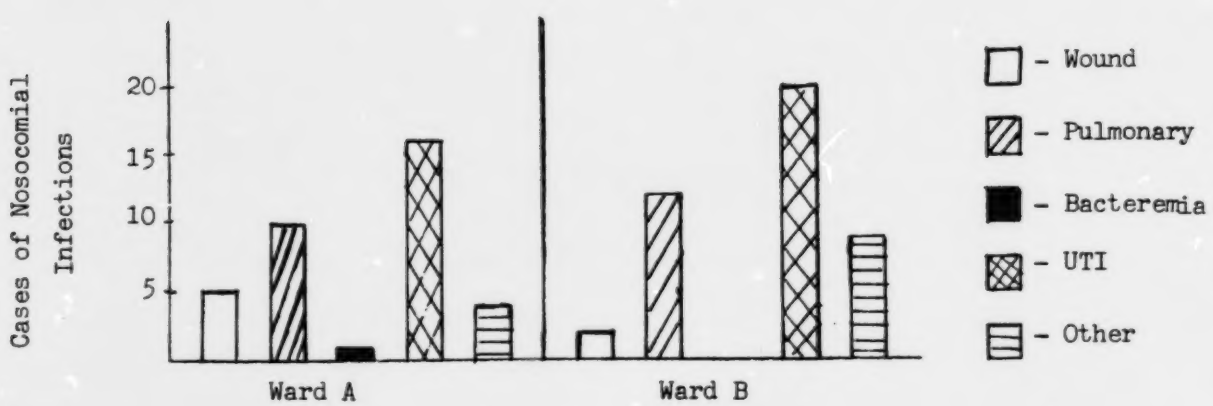
Nosocomial Infection Rate



BAR CHART

Nosocomial Infections at Specific Sites

Month of November



APPENDIX IV

ISOLATION

The Isolation Room

The isolation room serves to separate infected persons from others during the period of communicability and to prevent direct and indirect transmission of the infectious agent.

Single rooms are required for strict or respiratory isolation and desired for enteric or wound and skin precautions. If a two-bed room must be used for either of the latter two, the infected patient should be placed nearest the sink and bathroom, his cubicle clearly designated as isolation with explanations given to both patients and visitors and an alternate bathroom or a commode supplied for the non-infected patient if the precautions are enteric.

An antiseptic solution (e.g. iodophor or chlorhexidine) should be available for handwashing.

If a sink is not in the room, a basin of water could be used provided it is changed frequently. Rooms regularly used for isolation should be equipped with elbow, knee or foot operated faucets where possible: otherwise, paper towels can be used to turn taps on or off.

Articles which cannot be disinfected/sterilized or are not disposable should remain outside the room whenever possible. Everything within the room is considered contaminated (e.g. doorknobs, taps, toilet, articles).

Equipment Kept Inside Room

1. Linen hamper - bags usually a different colour or dissolvable plastic
2. Two trash containers with plastic liners - one for regular waste and one for glass
3. Non-penetrable container for needles, sharp items
4. Blood-letting equipment - tourniquet, vacutainer holder, tubes, needles, isolation labels
5. Thermometer with cover sheaths or holder and antiseptic solution
6. Hanger for reusable gowns - portable IV pole or permanent hooks just inside the door
7. Mop & paid - mop heads supplied daily
8. Diagnostic instruments (e.g. stethoscope, sphygmomanometer)

Equipment Kept Outside Room

1. Isolation Notification - bright attention getting colour
   - do not write patient's disease or diagnosis on card

ISOLATION

Please Obey the Precautions Indicated Below

	Required ✓	Comments
Handwashing	✓	
Mask		
Gown		
Gloves		
Door Closed		
Excretion Precautions		
Linen Precautions		
Special Precautions		

VISITORS: Please Contact Nurse Before Entering Room

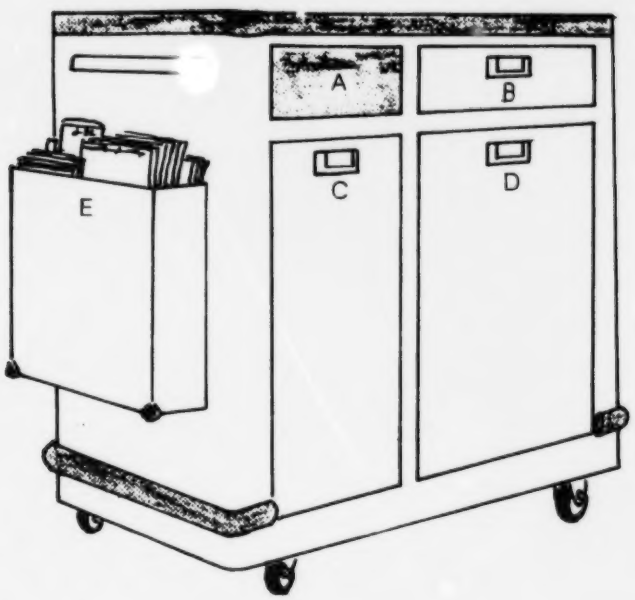
2. Trash container with plastic liner for masks, paper towels

3. Hanger for coats etc. of people entering room - portable pole or permanent hooks outside room

4. The Isolation Cart:

The isolation cart provides a clean working surface and a compact storage unit for supplies (e.g. isolation labels, autoclave tape (A), sterile and unsterile gloves, mask (B), gowns (C), linen bags (D), paper bags (E). It can be prepared as a unit and stored or assembled when the need arises. Restocking should be done regularly (e.g. q8h and prn) by the nurse or the central supply personnel.

The Isolation Cart



(Adapted from Wenzel et al. 1981)

Isolation Apparel

It is to be used as indicated on the Isolation notification card. Supplies are kept on the Isolation cart.

A. Donning Gown, Mask & Gloves

1. Put on gown, overlapping well in back to cover clothing. Tie waist strings securely. Neckband, strings and inside of gown are considered clean. Gown must not be worn outside of room.

2. Apply mask over mouth and nose. Change when moist or q45 minutes. Only ties are considered clean.

3. Remove watch and rings. Put on gloves, pulling cuffs over gown to protect wrists.

4. Enter room, leaving all unnecessary articles (e.g. chart, coffee pots) on isolation cart.

B. Removing Gloves, Gown & Mask

1. Remove gloves by "peeling off", turning them inside out and then discard in trash in room. If gloves not worn, unfasten waist ties of gown and wash hands.

2. Unfasten ties, remove gown. Either roll gown with contaminated side inside and place in hamper or hang on pole in room with contaminated side out.

3. Wash hands. Use paper towel to turn off taps and open door.

4. Exit and remove mask by ties, discarding it in trash outside room.

Protective Isolation

This type of isolation considers the patient and his room clean and all other things contaminated. Necessary adjustments from the above isolation room procedures are:

A. Linen and trash are discarded in the usual manner

B. The outside of the gown is considered clean and should be hung outside the room with the outside turned in if individual gowns are unavailable

C. Only articles which are considered clean should be taken into this room

Care of Contaminated Articles

A. Waste and Linen

The bag from the isolation room should be deposited into a second bag held by someone outside the door. By forming a cuff with the top of the second bag, the hands and the outside of the bag will not be contaminated. Label glass garbage.

B. Instruments, dishes

Separate metal and glass and place in bags (e.g. pillowcases). Double-bag as above and label with a list of contents. If both gas and steam sterilization are available, equipment should be bagged accordingly. Central supply should provide a list of items and their appropriate method of sterilization. The list can be posted in the isolation room.

C. Specimens

Place labelled specimen into bag (plastic or paper) without contaminating the outside, i.e., have another person receive it from outside the room or drop into a bag previously opened at the

doorway. Label bag appropriately with name of patient, type of specimen and type of isolation.

Transportation of Patient

A. To Departments

1. Patients in strict isolation should not be transported. For transport of patients with haemorrhagic fevers (e.g. Dengue, Lassa, Ebola, Crimea) consult CPL.

2. Patients in respiratory isolation should wear a mask.

3. Drape clean sheet over wheelchair or stretcher.

4. While maintaining isolation technique, assist patient to wheelchair or stretcher.

5. Wash hands, then grasp clean underside of sheet and fold over patient.

6. Remove isolation apparel, wash hands and transfer patient.

7. For transportation in bed, wipe exposed areas of bed with germicidal solution (phenolic or glutaraldehyde) and cover patient and bed with clean sheet.

8. For transport in crib, use clean crib if possible.

9. Notify department of isolation precautions.

B. To Morgue

1. Following the isolation precautions indicated, prepare the body and cover any draining area with a dressing.

2. Drape stretcher with clean sheet.

3. Place the body on stretcher and cover with another clean sheet.

4. Remove isolation apparel and wash hands.

5. Include notification of isolation type with identification of the body.

Cleaning of Isolation Room

A. Concurrent

1. Following the isolation precautions indicated, wash sink,

basin, faucets, door-knobs, radiator, window sills, chairs and tables with a germicidal detergent (phenolic, glutaraldehyde or hypochlorite).

2. Replenish supplies (e.g. soap, paper towels).

3. Empty trash by double-bagging. (See Care of Contaminated articles)

4. Damp mop floor with detergent and water.

   A separate mop and pail could be used for the isolation room and the mopheads double-bagged for laundering on a daily basis.

B. Terminal

1. Following the isolation precautions indicated, remove all linen, curtains, cloth pillows, equipment, trash, etc. (See Care of Contaminated Articles).

2. The bedpan brush used for Enteric precautions should be discarded.

3. Wipe with germicidal detergent (phenolic) all beds, mattresses, plastic pillows, furniture, sink, toilet, doorknobs, windowsills, (walls, doors, windows) and floor.

APPENDIX V

EXAMPLES OF PROTOCOLS FOR STERILIZATION/DISINFECTION

Routine Handwashing

Under comfortably warm, running water, wet hands and lather with _____ (well drained bar soap) for _____ (15-30 sec.) using friction on all aspects of fingers and hands. Rinse hands so that the lather does not contaminate arms or clothing and dry with paper towel. If foot or elbow taps are not available, turn taps off with dry, paper towel. Rings, watches and nailpolish make it difficult to remove microorganisms and should not be worn on duty.

Handwashing for Invasive Procedures

As above, using _____(chlorhexidine, iodophor, hexachlorophene) for _____ (2 min.).

Handwashing for High Risk Areas (ICU, Newborn Nursery)

When entering the area, wash hands with _____ (chlorhexidine, iodophor, hexachlorophene) for _____ (2 min.). Thereafter, do routine handwash between patients and antiseptic handwash before invasive procedures. Since antiseptic solutions are very drying to the skin, hand lotions should be available.

Pre-operative Handscrub

Using a sterile sponge or brush, scrub from nails to elbow with _____ (chlorhexidine, iodophor or hexachlorophene) for _____ (5 min.). Rinse under running water and repeat for other arm. Dry with sterile towel.

These agents have tended to replace alcohol because of their substantive effect. The length of surgery may affect one's choice of agent because of this substantive effect (e.g. hexachlorophene works best in the first hour, whereas an iodophor works best between one and four hours).

Pre-operative Skin Preparation

When necessary, shave the operative site immediately pre-operatively.[1] Follow with a scrub, using _____ (soap & water) for _____ (2 min.). Just prior to the operative procedure, scrub site with _____ (1% iodine removed with alcohol, iodophor, tincture of chlorhexidine) for _____ (2 - 5 min.) and allow to dry. The last scrub should be

done by a person wearing gloves and using sterile equipment.

Sterilization by Steam, Dry Heat or Gas

Detailed operating instructions are available from the manufacturers of these sterilizers with recommendations for different types and sizes of loads. Protocols should be drawn up with these as the base.

All sterilizers should be tested _____ (weekly) with _____ (Bacillus stearothermophilus for steam, Bacillus subtilis for gas). Any positive spore test should be followed by another test load immediately. If positive, the contents should be held, or recalled, and the sterilizer checked for malfunction.

Cold Sterilization (Disinfection)

All equipment which requires sterilization but cannot withstand heat or gas (e.g. lensed instruments, respiratory equipment, thermometers) should be thoroughly cleaned and soaked in glutaraldehyde at the concentration and for the time recommended by the manufacturer.

Environmental Cleaning

Floors, walls, furniture etc. should be cleaned with _____ (detergent and water, phenolic) on a _____ (daily, monthly) basis as determined by the frequency of soiling (e.g. floors - daily, walls q 3 months or prn).

Laundry Operations

Soiled linen shall be _____ (bagged or placed in carts) at the location it is used. It should be transported to and sorted in the laundry.

Contaminated linen must be bagged separately and marked distinctively with a _____ (colour coded bag or label).

Hands should be washed after handling any linen.

Laundering at water temperatures of 71°C (160°F) with suitable supplies for 25 minutes is adequate.

APPENDIX VI

AGENTS FOR STERILIZATION/DISINFECTION

Group 1: Oxidizing Agents

Generic Names: 1. Hydrogen Peroxide (H_2O_2)

2. Potassium Permanganate

Range & Time of Action:

Not appropriate for hospital disinfection.

Concentration:

Potassium permanganate 1:10,000 Aqueous solution

Problems:

- poor penetration
- stains or decolorizes

Benefits:

- H_2O_2 is effective for removal of debris by effervescence.
- Pot. Permanganate 1:10,000 capable of destroying viruses in suspension in ½ hr. at room temperature.
- Pot. Permanganate is used for patients with generalized skin infection.

Instrument Safety:

Not suitable.

Trade Names:

None

Group 2: Mercurials and other Heavy Metals

Generic Names:
1. Thiomersal
2. Mercurochrome (Registered Tradename in some countries)
3. Silver Nitrate ($AgNO_3$)

Range & Time of Action:

Not appropriate for hospital disinfection.

Concentration:

Merthiolate 1:10,000 Aqueous or in 70% Ethyl Alcohol, Silver nitrate 0.5 - 1%

Problems:

- mercurials are bacteriostatic only
- mask growth of Pseudomonas and other Gram negative bacteria
- $AgNO_3$ is caustic

Benefits:

- Merthiolate is used to toughen skin e.g. pressure areas.
- $AgNO_3$ is used as prophylaxis in ophthalmia neonatorum and burns. $AgNO_3$ is usually incorporated in Sulphacetamide cream or ointment for burns (e.g. Flamazine)

Instrument Safety:

Not suitable

Trade Names:

1. Merthiolate
2. Mercurochrome

Group 3: Quaternary Ammonium Compounds (Quats)

Generic Names: 1. Benzalkonium Chloride
2. Centrimide

Range & Time of Action:

- good against Gram positive organisms in vitro
- fair against Gram negative organisms in vitro

pH. 7.0

Concentration:

- aqueous or alcohol solution

Problems:

- inactivated by gauze, cotton, soap, hard water, iodine and detergents
- supports growth of Pseudomonas well
- repeated wet soaks may lead to sensitivities

Benefits:

- pleasant odour
- non-irritating

Instrument Safety:

- safe for fiberoptics, metals, rubber/plastics provided instruments thoroughly cleaned of organic materials prior to immersion.

Trade Names:

Zephiran, Roccal, Antisept, Benzalchlor -50, Benzalide, HI-TOR AVIKEM FH, Benzalkone, Dermosterol, Drapolex, Ionax, Germiphene, Soakare, Marinol, TBQ, A33, Tergiquat, Resiguard, Savlon*, Cetavlon, Urolicide, CTAB, Arquad 16, Gloquat C., BTC 824, Hyarmine 3500, Cyncal Type 14, Catigene, Riseptin, BTC 2125M., Deciquam 222, Bardac 22, BTC 812, Cepryn, Isothan Q, BTC 1100, Onyxide 3300, Loroquat QA 100, Onyxide 172, Dequadin, WSCP, BTC 50, Cycloton B50, Drapolene, Empigen, BAC, Polycide Silquat B10, Silquat B50, Stomobar, Stomogel, Vantoc CL, Tricidal, Vantropol FHC, Microl, Resistone QD, Gloquat, 1492.

*Savlon - combination cetrimide/chlorhexidine

Group 4: Biguanides

Generic Names: chlorhexidine

Range & Time of Action:

- good against Gram positive and Gram negative organisms — 2 min.
- fair against Pseudomonas

pH: 8.5

Concentration:

Aqueous or alcohol solution

Problems:

- will support growth of Pseudomonas, Proteus
- for savlon* - see problems of Quaternary ammonium compounds - cetrimide
- instillation in ears may cause sensorineural deafness
- stains linen - use sodium perborate bleach rather than hypochlorite

Benefits:

- not absorbed by skin
- has a prolonged activity of >6 hrs. in gloves
- non-irritating

Instrument Safety:

safe for fiberoptics, metals, rubber/plastics

Trade Names:

Hibitane, Hibiclens, Hibiscrub, Dermofax, Savlon*

*Savlon - combination cetrimide/chlorhexidine

Group 5: Phenolics (Phenol derivatives)

Generic Names:
1. Phenol (carbolic acid)
2. Cresol
3. Other phenol compounds

Range & Time of Action:

- good against Gram negative organisms, including Pseudomonas
- fair against Gram positive organisms and T.B.
- poor against spores
- will kill virus after 60 minutes

pH: 5.5, efficacy reduced as alkalinity approached

Concentration:

- 1 - 3% aqueous solution

Problems:

- cause depigmentation of skin and injury to mucous membrane
- may cause hyperbilirubinemia in neonates if used in nursery

Benefits:

- good for environmental cleaning when this is indicated

Instrument Safety:

- safe for metals

Trade Names:

Clearsol, Hycolin, Creolin, Sterilite, Sudol, Izal, Jeyes Fluid, Lyseptol, Printol, Stericol, Pynol, Sterillium, Neo-Monsol, Germicide pD 114, Sanikleen, Lysol, Beaucoup, RotoSan, Zal, Disfex, LPH, Staphene, Gomaxide, Halocide 10, Novasapa, Resorcinol, Chlorothymol, Carvasept soap, Zant, DRX.

Group 6: Synthetic Bisphenols

Generic Names: 1. Hexachlorophene
2. Dichlorophane

Range & Time of Action:

- good against Gram positive organisms
- poor against Gram negative organisms
- builds film over 3-5 days of repeated use

pH: 5.5

Concentration:

0.25 - 3% alcoholic solution

Problems:

- slow, requires repeated use to build film
- alcohol inactivates film instantly
- toxic to neonates with excessive use. Use 0.3% for neonates.
- supports growth of Pseudomonas - allows colonization with Gram negative organisms
- absorbed through skin
- drying of skin
- rebound phenomenon
- inactivates Quats

Benefits:

- has a prolonged activity of >6 hrs. in gloves
- good against Staphylococcus aureus
- good for preparation baths for 2-3 days preoperatively
- retains activity when combined with soap.

Instrument Safety:

Safe for Metals

Trade Names:

pHisohex, G11, Surgiderm, Gamophene, Sapoderm, Steridermis, SterZac, EZ Scrub, phisomed, Dermohex, G4, preventol, Hexachlorone, Hexaphenyl, Soy-Dome.

Group 7A: Halogens - Iodine

Generic Names:
1. Tincture of iodine (Alcohol and Potassium Iodide added)
2. Iodine solution
3. Iodophors - next page

Range & Time of Action:

- fair against spores
- good against all other organisms

Concentration:

1 - 2% Alcoholic or Aqueous solution

Problems:

- sensitizes - to prevent this, remove with alcohol after iodine dries
- stains
- concentration is crucial because it becomes caustic if the alcohol evaporates
- irritates mucous membranes

Benefits:

- Rapidly achieves skin disinfection (approx. 1 min.) can be removed with 70% ethanol.

Instrument Safety:

Can be used for instruments in emergency sterilization circumstances. Detrimental to metal.

Trade Names:

Lugol's Iodine (Aqueous Iodine Solution)

Group 7B: Halogens - Iodophors (iodine & surfactant)

Generic Names:

Providone - iodine

Range & Time of Action:

- good against Gram positive and Gram negative organisms 4 min.
- fair against Pseudomonas and T.B.
- Wescodyne in Ethanol will kill virus 20 min.

pH: 3.5

Concentration:

See container for concentration.
Aqueous or alcoholic solution.

Problems:

- corrosive to instruments made of silver or ferrous alloy
- drying of skin
- supports growth of Pseudomonas
- occasional sensitization

Benefits:

- stains are temporary
- sensitization less frequent than with Iodine
- long action

Instrument Safety:

Not suitable.

Trade Names:

Betadine, Wescodyne, Bridine, Vanodine, Prepodyne, Septodyne, Isoprep, Kleenodyne, Surgidine, Disadine, EZ Scrub, Poviodine, Efodine, Isodine, Ultradine

Group 7C: Halogens - Chlorine

Generic Names: Sodium Hypochlorite

Range & Time of Action:

- good against Gram positive and Gram negative organisms	1-3 min.
- fair against Pseudomonas	
- poor against spores	8 min.
- good against hepatitis virus & other viruses	30 min.

pH: 11.0

Concentration:

1 - 5%

↑ Temperature causes ↑ bactericidal activity (aqueous solution)

Problems:

- deteriorates with time - chlorine dissipates
- corrosive
- irritates skin
- causes rapid deterioration of metals
- inactivated by serum, blood, stool, vegetable matter etc.
- choking odour

Benefits:

- virucidal
- bactericidal
- inexpensive

Instrument Safety:

Safe for rubber/plastics.

Trade Names:

Chloros, Javex, Domestos, Septonite, Diversol BX, Hygeol, Eusol, Dakins

Group 8: Alcohols

Generic Names: 1. Isopropyl
2. Ethyl

Range & Time of Action:

- good against Gram positive and Gram negative organisms including Pseudomonas — 1-3 min.
- fair against T.B.
- kills some virus — 10 min.
- friction increases the effect

pH: 7.0

Concentration:

60 - 80%

Problems:

- evaporation results in short effect
- drying because it defats skin
- hardens plastics
- irritates mucous membranes
- volatile, flammable

Benefits:

inexpensive

Instrument Safety:

safe for metals

Trade Names:

Avantine, EZ Scrub, IPS/C, IPS .1, Alcojel, Medi-Swabs, Sterets, sterile Pack Fluid.

Group 9A: Aldehydes

Generic Names: Formaldehyde Solution
Formalin

Range & Time of Action:

- good against Gram positive, Gram negative, Pseudomonas, T.B., Fungi
- fair against spores and virus (3 hr.)

pH: 3.5

Concentration:

8% aqueous or alcoholic solution

Problems:

- noxious odour, irritating
- poor penetration
- toxic

Benefits:

- cheap
- long shelf life

Instrument Safety:

safe for metals and rubber/plastics

Trade Names:

Formalin, Pict's solution

Group 9B: Aldehydes

Generic Names: Glutaraldehyde

Range & Time of Action:

- good against all organisms	15 - 20 min.
- spores	10 hrs.

pH: 7.5 - 8.5

Concentration:

2% Aqueous or Alcoholic solution

Problems:

- may lose pH in 2-3 weeks or with heavy use and will then support growth of Pseudomonas
- toxic
- acidic solutions pit instruments
- dilution of solutions below 1% causes loss of activity
- time span for effectiveness is from the time of activation.

Benefits:

- disinfection of inhalation therapy equipment and fiber optics.

Instrument Safety:

safe for fiberoptics, metals, rubber/plastics

Trade Names:

Cidex (Alkaline), CidexFormula 7,
Glutarex, Sonacide (acidic)

Group 10A: Miscellaneous

Generic Names: Acetic Acid

Range & Time of Action:

especially good against Pseudomonas

Concentration:

1% Aqueous solution

Problems:

- corrosive
- irritating odour

Benefits:

- cleaning respiratory equipment (e.g. rubber tubing, nebulizers, etc.)

Instrument Safety:

Not suitable.

Trade Names:

Vinegar (not pure acetic acid but will work), Acetum

Group 10B: Miscellaneous

Generic Names: Ethylene Oxide (Et_2O) Gas

Range & Time of Action:

- good against all organisms
- 2-36 hours depending on temperature

Concentration:

500 - 1000 mg Et_2O/1.

Problems:

- needs scrupulous pre-cleaning of equipment
- special equipment necessary - Et_2O autoclave, aerator, CO_2 Freon to mix with Et_2O
- Et_2O used in canisters is uncontrolled and therefore not recommended
- explosive when mixed with O_2 or air
- irritating to nose, eyes
- may cause nausea & vomiting, diarrhea, headache, vertigo, dyspnea, pulmonary edema, death
- excessive exposure of skin to liquid or solution causes burns and blistering
- may not penetrate small tubes, etc.

Benefits:

- sterilize materials that cannot be steam or liquid sterilized

Instrument Safety:

Yes (if permeable to ET_2O)

Trade Names:

Cartox, Sterethox, Carboxide, Etox, Steroxide, Cryoxide

APPENDIX VII

EXAMPLES OF PROTOCOLS FOR URINARY CATHETERIZATION

Midstream Urine Specimen

Procedure:

1. Wash perineal area thoroughly with soap and water.
2. Collect specimen after sufficient urine has been passed to flush the urethra and without contaminating the container.

Catheterization

Equipment:

1. Sterile catheterization tray containing:

2 kidney basins	1 3 x 3 gauze
2 bowls	6 cotton balls
2 forceps	drape
1 10 c.c. syringe	

2. Antiseptic Solution (e.g. Povidone-iodine, chlorhexidine)
3. Sterile normal saline
4. Sterile lubricant
5. Sterile gloves
6. Sterile catheter of appropriate size
7. Sterile specimen container
8. Sterile drainage bag
9. Incontinence pad
10. Tape

Procedure:

1. Prepare patient
   a) Position on back with incontinence pad under buttocks
   b) Drape top sheet to expose perineum
   c) Cleanse perineum with soap and water
   d) Adjust light

2. Prepare equipment

   a) Wash hands

   b) Open tray and add:

      - lubricant onto 3 x 3 gauze
      - sterile normal saline into bowl
      - sterile antiseptic solution into bowl
      - catheter

   c) Open specimen container

3. Method

   a) Put on sterile gloves

   b) Lubricate catheter tip

   c) Draw up 5 cc normal saline into syringe

   d) Position sterile drape

   e) Insertion

      i) - cleanse genitalia with antiseptic solution

         (Female - keeping labia separated, sponge front to back both sides and over meatus. Male - holding penis at 60° angle, sponge from meatus outward.)

         - the hand touching the genitalia is contaminated

         - discard cotton balls and forceps into first kidney basin

      ii) - Place second kidney basin with lubricated catheter near perineum. Using second forceps, pick up catheter 3 inches from end, insert gently into meatus and advance until urine flows.

         (Female - if catheter goes into vagina, leave there until a new catheter is inserted into the meatus. Male - lower penis as catheter enters the bladder.)

      iii) Advance catheter 1 - 2 inches more and inflate balloon with prescribed amount of normal saline if catheter is to be left in place.

      iv) Collect urine specimen directly from catheter.

      v) Attach closed drainage system bag to catheter. Secure with tape to the leg. Hang bag below bladder level but not touching the floor. Pin coiled tubing to the bed.

vi) If 1000 cc. of urine drains, clamp catheter for 1 hour and release, repeating until bladder empties.

vii) Leave patient comfortable, remove equipment.

viii) Instruct patient

a) Bag or tubing should never be raised above the level of the bladder or touch the floor.

b) Tubing should never be disconnected from the catheter.

c) When emptying, do not touch the spigot to the emptying receptacle or toilet.

Maintenance of Closed Drainage System (Adapted from DeGroot, 1972)

To decrease the risk of urinary tract infection, three areas of the drainage system must be protected.

1. Catheter - Meatus Area

- Cleanse area twice a day with soap and water to prevent bacterial invasion. Dry thoroughly.

- If shower or tub bath allowed, do not disconnect the system.

- Anchor catheter at all times to prevent tension and trauma of the urethra.

2. Catheter - tubing Junction

- Aspirate urine specimens directly from the catheter with a sterile syringe and needle. Cleanse the area before and after with an alcohol sponge, using friction. Insert needle at a slant (for self-sealing) and do not puncture the balloon. If no urine, clamp tubing until sufficient urine has collected in the catheter.

- Discourage irrigations. When necessary, cleanse the junction with alcohol and use sterile equipment and solutions.

- For ambulation, maintain system. Keep bag and tubing below bladder level at all times to prevent reflux of contaminated urine and off floor to prevent contamination.

3. Mouth of Spigot

- Protect from contamination by emptying the bag without touching spigot to receptacle.

- Use individual emptying receptacles.

Change Schedule

Change catheters once a month and drainage bags every 2 weeks or more frequently as necessary.

External Catheters (Adapted from DeGroot, 1972)

These provide a means of controlling incontinence with a lower risk of urinary tract infection than instrumentation.

Procedure:

1. Shave hair at base of penis
2. Cleanse penis with soap and water and dry thoroughly
3. Apply catheter over penis and secure at base
4. Attach to closed drainage system and secure to leg
5. Change daily, thoroughly cleaning and drying the perineal area.

APPENDIX VIII

EXAMPLE OF A

PROTOCOL FOR EMPLOYEE HEALTH

An employee health program is designed to provide:

1. surveillance and control of infectious diseases in employees
2. prevention of nosocomial infections
3. assessment of an employee's capability to perform his/her job responsibilities
4. immediate care for an ill or injured employee pending referral to his/her physician.

Employees should be encouraged to report infectious diseases (e.g. boils, diarrhea) if they work in an area where this could be detrimental to the health of others. Providing alternate work or time off without loss of pay will facilitate such reporting.

The employer may elect to require that employees report illness when work is missed for _____ (1, 2...) days or that employees provide a medical certificate if work is missed _____ (e.g. 3) or more days.

Medical History

A great deal of information may be gained through taking a medical history. However, to prevent infringement upon human rights, specific verbal or written questions must be pertinent to employment. Such information may include pregnancy, hypertension, epilepsy, diabetes, deafness, visual problems, previous immunization, and infectious diseases. This information is to be obtained by a physician or nurse.

Physical Examination

This should also be pertinent to employment and need not be extensive. Disabilities which could affect one's job should be assessed. Weight and blood pressure (done with employee at rest and recumbent) are necessary parameters should emergency drug therapy be required because of an accident at work. Appropriate "Medalert" bracelets should be worn except in dealing with patients in isolation.

Ancillary

1. Immunization

   Suitable vaccines are generally offered to employees. Acceptance of this offer is entirely up to the employee. Discussion of benefits and potential risks should be available to the individual employee. Signed consent/refusals for vaccines (e.g. Rubella or BCG) may avoid potential legal implications.

Recommendations

1. Tetanus-diptheria booster - q 10 years

2. Rubella - available to non-pregnant fertile women who agree not to become pregnant for 3 months after the vaccine

3. Influenza - available to employees >60 years of age or who have other valid indications

4. BCG (see next section)

2. Tuberculosis Protocol

At Employment:

Tuberculin skin test (Mantoux) is done with intermediate-strength protein precipitated derivative of Siebert (PPD-S) - 5 TU

- Negative Reactors - repeat Mantoux q 2 years (yearly in high risk areas) or following significant exposure to a patient with active tuberculosis
- Positive Reactors - do chest x-ray
  - negative chest x-ray - repeat q 2 years (yearly in high risk areas) or following significant exposure to a patient with active tuberculosis
  - positive chest x-ray - refer to own physician

Mantoux negative employees in high risk areas should be offered Bacille Calmette Guérin vaccine (BCG).

If Exposed to TB:

- Mantoux negative contact will have Mantoux done immediately and again in 3 months
- Mantoux positive contact will have chest x-ray done immediately and and again in 3 months
- If either Mantoux or chest x-ray "converts", the contact will be referred to his/her physician regarding possible tuberculosis

Exposure: includes employees and patients at risk

At home - household member with tuberculosis

At work - close contact with a smear positive tuberculosis patient who was not properly isolated (e.g. handling of sputum, tracheal suctioning, sharing of room)

Random - prolonged contact with alcoholics, drug-abusers, or populations in which active tuberculosis is more common

3. Hepatitis Protocol

In order to decrease the number of hepatitis contacts, jaundiced patients in whom there is a strong possibility of having infectious hepatitis (e.g. chronic alcoholics, drug abusers, homosexuals) should be placed on isolation precautions until such a diagnosis can be ruled out. Similarly, patients who have had a close family contact with diagnosed infectious hepatitis should be isolated and investigated.

Viral hepatitis is an acute inflammation of the liver caused by one of several viruses (e.g. type A, type B, type nonA-nonB, CMV, EBV). Since the etiology and clinical manifestations of the types differ, individual protocols for managing contact cases are necessary. Detailed histories can facilitate identification of otherwise unknown hepatitis cases and thereby enable adequate precautions to be taken. In all cases, efforts must be made to identify the index case and to establish the exact degree of exposure.

Hepatitis A

Incubation Period: 2-6 weeks

Mode of Transmission: fecal-oral (occasionally parenteral)

Tests: Anti HAV - IgM (send serum to CPL)

Contact: 1. Close - those who handle body excretions and those who have shared common food and/or housing in the previous 24 hours

Treatment - Immune Serum Globulin (ISG) within 48 hours (0.04 ml/kg)

2. Casual

Treatment - Nothing; if contact well after three weeks, the SGPT could be checked

Isolation Protocol: - Enteric Precautions
- Blood Precautions

Hepatitis B

Incubation Period: 2-6 months

Mode of Transmission: Serum, body secretions

Tests: HB_sAg (formerly Australian Antigen) - send serum to CPL

Contact: 1. Close - needlestick, resuscitation, handling placenta

Treatment - when index case HB_sAg positive, give contact Hepatitis B Immune Globulin (HBIG) within 48 hours and repeat in 1 month (0.05 - 0.07 ml/kg)

2. Casual

Treatment - nothing, if contact well after three months, the HB_sAg could be checked.

Isolation Protocol: - Blood Precautions
- Secretion Precautions - Oral
- Enteric Precautions

Hepatitis NonA-NonB

Incubation period: 2 weeks - 6 months

Mode of Transmission: Transfusions, other means as yet unknown

Tests: Rule out Hepatitis A, Hepatitis B, Cytomegalovirus, Epstein Barr Viruses

Contact: 1. Close - needlestick, handling placentas, stool, secretions

Treatment - Could give ISG

Isolation Protocol: - Enteric Precautions
- Blood Precautions

CMV - Cytomegalovirus

Incubation Period: a) Estimate 3 - 5 weeks post transfusion
b) Few days in nurseries

Mode of Transmission: urine, saliva

Tests: Urine (fresh) for virus isolation
Serology - acute and convalescent sera to CPL

Contact: No treatment

Isolation Protocol: - Enteric Precautions - urine

EBV - Epstein Barr Virus - Infectious Mononucleosis

Incubation Period: estimate 4 - 14 days

Mode of Transmission: saliva

Tests: Serology - screen test
- acute and convalescent sera to CPL

Contact: No Treatment

Isolation Protocol: Secretion Precautions - Oral

Staff Health Screening

Employees coming from a geographical area where hepatitis is highly endemic or with a history suggestive of recent hepatitis should have a HB_sAg done. If positive, this employee should refrain from all preparation and/or handling of food other than for personal use.

4. Work - specific:

A. Dietetics

- at employment, test stool x i for Salmonella species in areas where incidence of enteric infections is high
- diarrhea - off work until symptoms resolve and stool x i is negative
- staphylococcal infections (e.g. boils) - off work until resolved
- streptococcal infections - off work until 48 hours of antibiotic therapy

B. Nurses with Patient Contact

- staphylococcal infection - off work until resolved
- staphylococcal carrier - if outbreak of Staphylococcus in newborn nursery, move employee to another function or ward until epidemic ceases
- streptococcal infection - off work until 48 hours of antibiotic therapy
- herpes simplex or zoster (shingles) - no contact with immunosuppressed, obstetrical or newborn patients

5. Service:

The hospital could elect to offer additional tests as a service to employees >45 years of age (e.g. yearly chest X-ray for smokers, BP, EKG).

Glossary

Antiseptic	- a chemical agent having the ability to destroy potentially infective microorganisms and which can be used safely on living tissue.
Aseptic	- free from potentially infective microorganisms
Attack rate	- an incidence rate calculated for a given population and time period (e.g. in an epidemic). Expressed as a percent.
Bactericidal	- destructive to bacteria
Bacteriostasis	- the arrest or strong inhibition of the growth of bacteria
Carrier	- a person who, though showing no symptoms of disease, harbors pathogenic organisms in his body and spreads infection to others. A colonized person.
Colonization	- the presence and replication of a pathogenic microorganisms in a host without a clinical expression or an immune response.
Contact Case	- any person who has been in contact with an index case. Usually determined as close or casual by degree of exposure.
Disinfectant	- a chemical agent having the ability to destroy potentially infective microorganisms. Usually refers to use on inanimate objects.
Endemic	- describes a disease which is constantly present in a given area
Epidemic	- an increase in the incidence of a disease above the expected endemic rate
Epidemiology	- the study of epidemics; defines the relationship of disease to the population at risk
Fomites	- substances capable of absorbing and transmitting infectious microorganisms
Gram-negative (Gm-ve)	- Most bacteria can be stained by Gram's method to allow their division by colour. Gram-negative bacteria appear red.
Gram-positive (Gm+ve)	- Most bacteria can be stained by Gram's method to allow their division by colour. Gram-positive bacteria appear purple.

Incidence	- measure of the rapidity with which a disease occurs or the frequency of addition of new cases of a disease. Measured for a given period of time
Incubation period	- the development of an infectious disease from the time of inception to the appearance of the first symptom
Index case	- the first person to exhibit disease in an outbreak
Infection	- invasion and replication of pathogenic microorganisms in the tissues of a host
Infection percentage	- measure of the people with at least one nosocomial infection in the population at risk
Infection ratio	- measure of nosocomial infections at a given site in the population at risk. Expressed as a percent.
Microbial finger printing	- specific techniques which are used to differentiate between members of the same species of organisms (e.g. phage typing of Staphylococcus aureus, pyocine typing of Pseudomonas aeruginosa)
Nosocomial	- hospital acquired, either developing during hospitalization or resulting from microorganisms acquired while hospitalized.
Pathogenicity	- the ability of microorganisms to cause disease
POW	- post-operative wound
Prevalence	- measure of the frequency of all current cases of disease
Prospective study	- collection of data as the event occurs
Rate	- measure of the probability of occurrence of a particular event. Given in the form $\frac{x}{y} X k$ where:

x = number of times an event has occurred during a specific interval of time

y = number of persons exposed to the risk of the event during the same interval

k = some round number (100; 1,000; 10,000; etc.) or base, depending upon the relative magnitude of x and y.

Retrospective study	- collection of data after the event has occurred

Sterilization	- use of physical or chemical agents to eliminate all viable microbes
Virulence	- measure of the severity of disease caused by microorganisms

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